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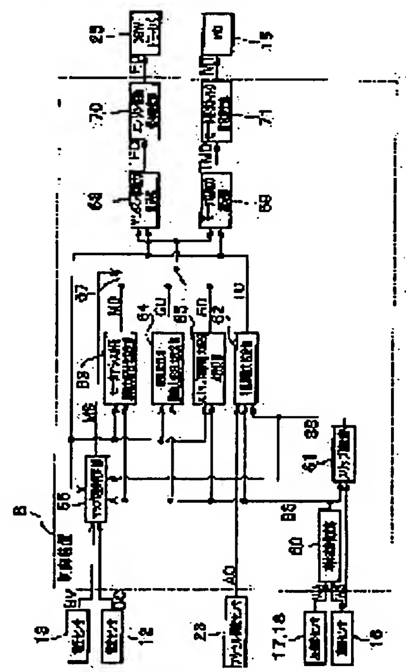
(54) CONTROL DEVICE FOR FRONT AND REAR-WHEEL-DRIVE VEHICLE



(57)Abstract:

PROBLEM TO BE SOLVED: To provide a control device for a front and rear-wheel-drive vehicle capable of distributing driving force at the optimum energy efficiency while reducing power consumption and improving fuel consumption.

SOLUTION: The control device 6 for the front and rear-wheel-drive vehicle having one of front and rear wheels driven by an engine and the other driven by a motor comprises target driving force setting means 62 for setting target driving force in accordance with a operating condition, a motor assisting driving force distribution ratio setting part (distribution ratio setting means) 63 for setting the driving force distribution ratio of engine driving force to motor driving force depending on the degree of fuel consumption improving contribution found from a predetermined first expression in accordance with the target driving force and a vehicle speed, and a generating travel driving force distribution ratio setting part (charging distribution ratio setting means) 64 for setting the charging distribution ratio of the engine driving force to the motor driving force depending on the degree of charging fuel consumption improving contribution found from a predetermined second expression in accordance with the target driving force and the speed. The engine driving force and the motor driving force are controlled in accordance with the driving force distribution ratio and the charging distribution ratio.

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CLAIMS

[Claim(s)]
[Claim 1] A target driving force setting means to be the control unit of a ring drive car before and after driving one side of the wheel of order with an engine and driving the wheel of another side by the motor, and to set up the target driving force of said order ring drive car based on operational status, It is based on the target driving force and the vehicle speed which were set up by said target driving force setting means. (1) An allocation ratio setting means to ask for the improvement contribution in fuel consumption by the formula, and to set up the driving force allocation ratio of engine drive and the motorised force based on said improvement contribution in fuel consumption, The control unit of a ring drive car before and after characterizing by controlling engine drive and the motorised force by the driving force allocation ratio set up by the preparation and said allocation ratio setting means.
C= (EF-AF)/PU ... (1)
C Improvement contribution EF in :fuel consumption : power consumption at the time of adding the fuel consumption PU:motorised force predicted when the fuel consumption AF:motorised force when engine drive attains said target driving force is added [claim 2] While driving one side of the wheel of order with an engine and driving the wheel of another side by the motor A target driving force setting means to be the control unit of a ring drive car before and after charging an accumulation-of-electricity means by the generation of electrical energy by said motor, and to set up the target driving force of said order ring drive car based on operational status, It is based on the target driving force and the vehicle speed which were set up by said target driving force setting means. (2) At the time of the charge which asks for the improvement contribution in fuel consumption by the formula at the time of charge, and sets up an allocation ratio based on the improvement contribution in fuel consumption at the time of charge with engine drive and the motor generation-of-electrical-energy force at the time of said charge, allocation ratio setting means, The control unit of a ring drive car before and after characterizing by controlling engine drive and the motor generation-of-electrical-energy force by the allocation ratio at the time of the charge set up by the allocation ratio setting means at the time of a preparation and said charge.
CC= (GF-EF) / PC ... (2)
the time of CC:charge -- improvement contribution EFin fuel consumption: -- the power charge at the time of adding the fuel consumption PC:motor generation-of-electrical-energy force predicted when the fuel consumption GF:motor generation-of-electrical-energy force when engine drive attains said target driving force is added

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[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the control unit of a ring drive car while driving one side of the wheel of order with an engine, before and after driving the wheel of another side by the motor.
[0002]
[Description of the Prior Art] The ring drive car before and after driving one side of the wheel of order with an engine and driving the wheel of another side by the motor in recent years is developed. An order [this] ring drive car is a car which reconciled the low-fuel-consumption nature as a hybrid car, and the running-the-whole-distance nature as a four-wheel drive car.
[0003] An order ring drive car is equipped with the dc-battery in which the power supplied to a motor is stored, and is equipped with the generator for charging this dc-battery. When operating as a generator the motor which drives a wheel, a motor revives a part of transit energy of a car to electrical energy, and stores this electrical energy in a dc-battery. In addition, regeneration by the motor is usually performed at the time of the moderation transit which is not broken into the accelerator pedal. However, even when the power residue of a dc-battery turns into below a predetermined power residue, and getting into the accelerator pedal, it charges compulsorily. In addition, damping force acts on the wheel driven by the motor at the time of the regeneration by the motor.
[0004] Furthermore, an order ring drive car sets up engine drive and the motorised force, and is equipped with the control unit which controls an engine and a motor. This control unit sets up target driving force required for the whole car based on the vehicle speed, the opening of an accelerator pedal, etc. And a control unit chooses a driving force allocation ratio from the map set up beforehand, and distributes target driving force to engine drive and the motorised force based on this driving force allocation ratio.
[0005]
[Problem(s) to be Solved by the Invention] In such a hybrid car, in order to raise fuel consumption nature, a driving force allocation ratio which makes engine specific fuel consumption min is chosen in many cases. If engine drive and the motorised force are set up based on such a driving force allocation ratio, the specific fuel consumption by the side of an engine will serve as min. However, in order to make specific fuel consumption into min, the driving force allocation ratio by the side of an engine may decrease, and the motorised force may increase. In this case, supply of the power from a dc-battery and charge of the power to a dc-battery increase. Consequently, when a driving force allocation ratio which makes engine specific fuel consumption min is chosen, the energy efficiency as a hybrid system by the engine and the motor may fall. That is, if engine specific fuel consumption is distributed so that it may become min in case driving force allocation of an engine and the motor is carried out as a hybrid system, the power consumption of a motor may increase. Therefore, in order to charge the consumed power at a dc-battery, engine drive is made to increase and a motor must perform the generation of electrical energy by regeneration. Consequently, the specific fuel consumption by the side of an engine increases, energy efficiency falls as a hybrid system, and fuel consumption also gets worse.
[0006] Then, the technical problem of this invention is to offer the control unit of a ring drive car

while reducing power consumption, before and after raising fuel consumption and distributing driving force with the optimal energy efficiency.

[0007]

[Means for Solving the Problem] The control unit of a ring drive car before and after starting this invention which solved said technical problem A target driving force setting means to be the control unit of a ring drive car before and after driving one side of the wheel of order with an engine and driving the wheel of another side by the motor, and to set up the target driving force of said order ring drive car based on operational status, It is based on the target driving force and the vehicle speed which were set up by said target driving force setting means. (1) Ask for the improvement contribution in fuel consumption by the formula, and it has an allocation ratio setting means to set up the driving force allocation ratio of engine drive and the motorised force based on said improvement contribution in fuel consumption. It is characterized by controlling engine drive and the motorised force by the driving force allocation ratio set up by said allocation ratio setting means.

C= (EF-AF)/PU ... (1)

C improvement contribution EFin :fuel consumption: -- ********** at the time of adding the fuel consumption PU:motorised force predicted when the fuel consumption AF:motorised force when engine drive attains said target driving force is added -- according to the control unit of an order [this] ring drive car In case it assists according to the motorised force, [the power consumption by the amount of fuel consumption reduction / motorised force by motor assistance] is max () by the allocation ratio setting means. That is, the assistant ratio (namely, driving force allocation ratio) of a motor is chosen so that the amount of fuel consumption reduction per power consumption by motor assistance may serve as max, and engine drive and the motorised force are set up. Consequently, since the maximum reduction of the fuel consumption can be carried out stopping power consumption as much as possible, the energy efficiency as a hybrid system improves.

[0008] Moreover, the control unit of a ring drive car before and after starting this invention which solved said technical problem While driving one side of the wheel of order with an engine and driving the wheel of another side by the motor A target driving force setting means to be the control unit of a ring drive car before and after charging an accumulation-of-electricity means by the generation of electrical energy by said motor, and to set up the target driving force of said order ring drive car based on operational status, It is based on the target driving force and the vehicle speed which were set up by said target driving force setting means. (2) Ask for the improvement contribution in fuel consumption by the formula at the time of charge, and it has an allocation ratio setting means at the time of the charge which sets up an allocation ratio based on the improvement contribution in fuel consumption at the time of charge with engine drive and the motor generation-of-electrical-energy force at the time of said charge. It is characterized by controlling engine drive and the motor generation-of-electrical-energy force by the allocation ratio at the time of the charge set up by the allocation ratio setting means at the time of said charge.

CC= (GF-EF) / PC ... (2)

the time of CC:charge -- improvement contribution EFin fuel consumption: -- power ****** at the time of adding the fuel consumption PC:motor generation-of-electrical-energy force predicted when the fuel consumption GF:motor generation-of-electrical-energy force when engine drive attains said target driving force is added -- according to the control unit of an order [this] ring drive car In case it generates electricity by the motor, [the power charge to the accumulation-of-electricity means by the fuel consumption augend / motor generation-of-electrical-energy force by the motor generation-of-electrical-energy force] is min () by the allocation ratio setting means at the time of charge. That is, the generation-of-electrical-energy ratio (at namely, the time of charge allocation ratio) in a motor is chosen so that the charge to the fuel consumption augend by charge may serve as max, and engine drive and the motorised force (negative value) are set up. Consequently, since the fuel consumption which increases carrying out the maximum reservation of the power charge can be controlled as much as possible, the energy efficiency as a hybrid system improves.

[0009] In addition, operational status shows the condition of operation about transit of a drive-before and after opening [of an accelerator pedal], the vehicle speed, etc. car.

[0010]

[Embodiment of the Invention] Hereafter, with reference to a drawing, the gestalt of operation of the

control unit of a drive car before and after starting this invention is explained.
[0011] The control unit of a drive car before and after starting this invention sets up a driving force allocation ratio from which [the power consumption in the amount of fuel consumption reduction / motor by assistance by the motor] serves as max with an allocation ratio setting means, and raises the energy efficiency of the hybrid system at the time of motor assistance. Moreover, this control unit sets up an allocation ratio at the time of charge to which [the power charge in the fuel consumption augend / motor by generation of electrical energy by the motor] serves as min with an allocation ratio setting means at the time of charge, and raises the energy efficiency of the hybrid system at the time of a motor generation of electrical energy.
[0012] With the gestalt of this operation, it considers as a ring drive car while driving a front wheel with an engine, before and after driving a rear wheel by the motor as a ring drive car before and after starting this invention. Moreover, the control device concerning the gestalt of this operation has the driving force allocation ratio map for motor assistance, a driving force allocation ratio map for generation-of-electrical-energy transit, and a driving force allocation ratio map for a slip as a map which distributes the driving force of engine drive and the motorised force. And in this control unit, when having not changed and slipped to the driving force allocation ratio map for a slip at the time of a slip, based on a dc-battery charge, the driving force allocation ratio map for motor assistance and the driving force allocation ratio map for generation-of-electrical-energy transit are changed, and engine drive and the motorised force are distributed based on each driving force allocation ratio map. In addition, the motorised force serves as a negative value (motor generation-of-electrical-energy force) at the time of a motor generation of electrical energy, and turns into damping force to engine drive.
[0013] First, with reference to drawing 1 , the whole order ring drive car (it is hereafter indicated as car) 1 configuration is explained. In addition, drawing 1 is the whole order ring drive car block diagram. In addition, with the gestalt of this operation, the order ring drive car 1 is equivalent to a ring drive car before and after indicating to a claim.
[0014] A car 1 drives the rear wheels 4 and 4 on either side by the motor 5 while driving the front wheels 2 and 2 on either side with an engine 3. And a control device 6 controls an engine 3 and a motor 5 by the car 1. In addition, with the gestalt of this operation, it is equivalent to one side of the wheel before and after the publication to a claim of front wheels 2 and 2, equivalent to the wheel of another side are given [rear wheels 4 and 4] in a claim in another side, equivalent to an engine with an engine 3 given in a claim, equivalent to a motor with a motor 5 given in a claim, and equivalent to a control unit with a control unit 6 given in a claim.
[0015] An engine 3 is carried in the anterior part of a car 1 every width. And it connects with front wheels 2 and 2 through an automatic transmission 7 and the front differential 8 equipped with torque-converter 7a, and an engine 3 drives front wheels 2 and 2. Moreover, as for an engine 3, a control unit 6 is connected to a throttle valve 26 through the DBW (Drive By Wire) driver 25. And driving force is set up by the control device 6, and, as for an engine 3, electronics control of the throttle valve 26 is carried out by the DBW driver 25 according to this driving force. The DBW driver 25 changes the opening of a throttle valve 26 by the motor.
[0016] A motor 5 is carried in the posterior part of a car 1. And a dc-battery 9 is connected and a motor 5 makes this dc-battery 9 a driving source. Furthermore, it connects with rear wheels 4 and 4 through an electromagnetic clutch 10 and the rear differential 11, and a motor 5 drives rear wheels 4 and 4. In addition, when power is supplied for a motor 5 from a dc-battery 9 and the electromagnetic clutch 10 is connected, rear wheels 4 and 4 drive and a car 1 will be in a four-wheel-drive condition. On the other hand, when the rotation drive of the motor 5 is carried out by the transit energy of a car 1, a motor 5 functions as JUNERETA and will be in a regeneration condition. In addition, a current sensor 12 and a voltage sensor 13 are formed in a dc-battery 9, and the dc-battery current signal BC and the battery voltage signal BV which were detected by these sensors 12 and 13 are incorporated by the control unit 6. Incidentally, the dc-battery current signal BC and the battery voltage signal BV are used in order to compute the power residue SOC of a dc-battery 9. In addition, with the gestalt of this operation, a dc-battery 9 is equivalent to an accumulation-of-electricity means given in a claim.
[0017] Moreover, a motor 5 is connected to a control unit 6 through Motor Driver 15. And the charge (driving force of a negative value) in the driving force and the regeneration condition in a

four-wheel-drive condition is set up by the control unit 6, and a motor 5 is controlled by Motor Driver 15 according to this driving force and charge. Motor Driver 15 is the control device of a motor 5, and performs current control of a motor 5 etc. Furthermore, as for an electromagnetic clutch 10, supply/halt of the current to the solenoid (not shown) by which connection/cutoff is judged and an electromagnetic clutch 10 is equipped with it with a control device 6 are controlled by the control device 6.

[0018] Furthermore, in order to control an engine 3 and a motor 5 by the control unit 6, the sensor for incorporating various information to a control unit 6 is formed in a car 1. The wheel sensor 16 of a magnetic pickup type and ... are respectively prepared in the front wheels 2 and 2 on either side and the rear wheels 4 and 4 on either side, and this sensor 16 and the wheel rotational frequency signal WS which is a pulse signal of the rotational frequency of each wheels 2, 2, 4, and 4 detected by ... are incorporated by the control unit 6. Moreover, acceleration sensors 17 and 18 are respectively formed in front wheels 2 and 2 and rear wheels 4 and 4, and the acceleration signal WA of the front wheels 2 and 2 detected by these sensors 17 and 18 and rear wheels 4 and 4 is incorporated by the control unit 6. In addition, acceleration sensors 17 and 18 may carry G sensor (magnetostriction type) before and after detecting the acceleration of the cross direction of a car body in the car-body mid gear of a car 1, may also incorporate the acceleration signal WA of the cross direction of the car body detected by this sensor to a control unit 6, and just ask for whenever [car-body-speed] correctly. Moreover, it is used in order that the wheel rotational frequency signal WS may compute whenever [wheel speed], and the acceleration signal WA is used in order to compute whenever [car-body-speed] with the wheel rotational frequency signal WS.

[0019] Moreover, the crank angle sensor 19 is formed in the crankshaft (not shown) of an engine 3, and the crank angle detected by this sensor 19 is incorporated by the control unit 6 as a crank pulse signal CP. Furthermore, the main shaft rotational frequency sensor 20 of a magnetic pickup type is formed in main shaft 7b of an automatic transmission 7, and the main shaft rotational frequency signal NM which is a pulse signal of the rotational frequency of main shaft 7b detected by this sensor 20 is incorporated by the control unit 6. In addition, crank pulse signal CP is used in order to compute an engine speed NE. Moreover, the main shaft engine-speed signal NM is used in order to compute slip ratio =NM/NE of torque-converter 7a with an engine speed NE.

[0020] Moreover, the resolver-type motor rotational frequency sensor 21 is formed in a motor 5, and the motor rotational frequency signal MS which is a pulse signal of the rotational frequency of the motor 5 detected by this sensor 21 is incorporated by the control unit 6.

[0021] Furthermore, the accelerator opening sensor 23 is formed in an accelerator pedal 22, and the accelerator opening signal AO containing ON/OFF of the accelerator pedal 22 detected by this sensor 23 is incorporated by the control unit 6.

[0022] A control unit 6 is a microcomputer (not shown) which consists of RAM (Random Access Memory), ROM (Read Only Memory), a CPU (Central Processing Unit), an I/O interface, etc. A control device 6 is equipped with driving force allocation ratio map 63d for motor assistance, driving force allocation ratio map 64d for generation-of-electrical-energy transit, and the driving force allocation ratio map for a slip as a map which distributes the driving force of engine drive and the motorised force (refer to drawing 3 and drawing 4). And a control unit 6 sets up target driving force based on accelerator opening and whenever [car-body-speed]. Furthermore, a control unit 6 changes the driving force allocation ratio setting section 63 for motor assistance, and the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit based on the dc-battery power residue SOC, when having not changed and slipped to the driving force allocation ratio setting section 65 for a slip at the time of a slip, and it sets up engine drive and the motorised force based on each driving force allocation ratio and target driving force. Then, a control device 6 sets up the motor demand torque signal MT based on the engine drive signal ED and the motorised force based on engine drive. And a control device 6 outputs the engine drive signal ED to the DBW driver 25, controls whenever [throttle valve-opening / of a throttle valve 26], and controls the driving force of an engine 3. Moreover, a control device 6 outputs the motor demand torque signal MT to Motor Driver 15, and controls the driving force of a motor 5.

[0023] Next, the configuration of a control unit 6 is explained with reference to drawing 2 . In addition, drawing 2 is the block diagram of the control unit 6 of an order ring drive car.

[0024] A control unit 6 has the presumed section 60, the slip detecting element 61, the target driving force setting section 62, the driving force allocation ratio setting section 63 for motor assistance, the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit, the driving force allocation ratio setting section 65 for a slip, the map change judging section 66, the map change section 67, the engine drive setting section 68, the motorised force setting section 69, the engine drive signal setting section 70, and motor demand torque signal setting section 71 grade whenever [car-body-speed]. In addition, with the gestalt of this operation, the target driving force setting section 62 is equivalent to a target driving force setting means given in a claim, the driving force allocation ratio setting section 63 for motor assistance is equivalent to an allocation ratio setting means given in a claim, and it corresponds to an allocation ratio setting means at the time of charge with the driving force allocation ratio setting section 64 for a generation of electrical energy given in a claim.
[0025] First, the presumed section 60 is explained whenever [car-body-speed]. The wheel rotational frequency signal WS from the wheel sensor 16 and ... and the acceleration signal WA from the acceleration sensors 17 and 18 are inputted, and the presumed section 60 outputs [whenever / car-body-speed] BS to the slip detecting element 61, the target driving force setting section 62, the driving force allocation ratio setting section 63 for motor assistance, the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit, the driving force allocation ratio setting section 65 for a slip, and the map change judging section 66 whenever [car-body-speed]. The presumed section 60 computes whenever [wheel speed / of each rings 2, 2, 4, and 4] based on the wheel rotational frequency signal WS whenever [car-body-speed]. Furthermore, the presumed section 60 computes [whenever / car-body-speed] BS whenever [car-body-speed / of a car body 1] based on whenever [hysteresis / of whenever / past car-body-speed /, and wheel speed], and, the acceleration signal WA, etc.
[0026] Next, the slip detecting element 61 is explained. BS is inputted [whenever / wheel sensor 16, wheel rotational frequency signal / from ... / WS and car-body-speed] whenever [from the presumed section 60 / car-body-speed], and the slip detecting element 61 outputs the slip detecting signal SS to the target driving force setting section 62 and the map change judging section 66. The slip detecting element 61 computes whenever [wheel speed / of each rings 2, 2, 4, and 4] based on the wheel rotational frequency signal WS. And the slip detecting element 61 computes the slip ratio of each rings 2, 2, 4, and 4 based on BS whenever [wheel speed / of each ring], and, whenever [car-body-speed]. Furthermore, based on the slip ratio of each rings 2, 2, 4, and 4, the slip detecting element 61 sets 1 as the slip detecting signal SS, when judging whether the car 1 has slipped and having slipped it, and when having not slipped, it sets 0 as the slip detecting signal SS. In addition, if slip ratio separates from the slip ratio of the four-flower rotation condition in the case of running the dry asphalt way, it will consider as a slip whether it has slipped or not.
[0027] Next, the target driving force setting section 62 is explained. The slip detecting signal SS from BS and the slip detecting element 61 is inputted [whenever / accelerator opening signal / from the accelerator opening sensor 23 / AO, and car-body-speed] whenever [from the presumed section 60 / car-body-speed], and the target driving-force setting section 62 outputs the target driving force TD to the driving force allocation ratio setting section 63 for motor assistance, the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit, the driving force allocation ratio setting section 65 for a slip, the map change judging section 66, the engine-drive setting section 68, and the motorised force setting section 69. In addition, the target driving force TD is driving force needed by the car 1, and is driving force generated by the engine 3 and the motor 5. Incidentally, when a motor 5 functions as a generator, the target driving force TD is altogether generated with an engine 3. Furthermore, the transit energy consumed by the motor 5 in this case is also generated with an engine 3.
[0028] And the target driving force setting section 62 was equipped with storage means, such as ROM, and has memorized the table on which BS and the accelerator opening signal AO, and the target driving force TD correspond whenever [car-body-speed / which was beforehand set up based on the experimental value or the design value]. In addition, this table has set up target driving force so that it may become so small that it is so large that accelerator opening is large and whenever [car-body-speed] is large. And when the slip detecting signal SS is 0, the target driving force setting

section 62 reads the target driving force TD which corresponds considering BS and the accelerator opening signal AO as the address whenever [car-body-speed]. On the other hand, when the slip detecting signal SS is 1, the target driving force setting section 62 computes road surface coefficient-of-friction estimate (coefficient of friction is hereafter indicated to be mu) based on the slip ratio of each rings 2, 2, 4, and 4. In addition, what was computed by the slip detecting element 61 is used for the slip ratio of each rings 2, 2, 4, and 4. Furthermore, based on the AUW and road surface mu estimate of a car 1, the target driving force setting section 62 computes the transfer driving force which can be transmitted to a road surface at the time of a slip, and makes this transfer driving force the target driving force TD.

[0029] Next, the driving force allocation ratio setting section 63 for motor assistance is explained. The target driving force TD from BS and the target driving force setting section 62 is inputted [whenever / car-body-speed] whenever [from the presumed section 60 / car-body-speed], and the driving force allocation ratio setting section 63 for motor assistance outputs the driving force allocation ratio MD for motor assistance to the map change section 67. The driving force allocation ratio setting section 63 for motor assistance was equipped with storage means, such as ROM, and has memorized driving force allocation ratio map 63d for motor assistance to which BS and the target driving force TD, and the driving force allocation ratio MD for motor assistance correspond whenever [car-body-speed / which was beforehand set up based on the experimental value or the design value] (refer to drawing 3). And the driving force allocation ratio setting section 63 for motor assistance reads the driving force allocation ratio MD for motor assistance which corresponds considering BS and the target driving force TD as the address whenever [car-body-speed]. In addition, driving force allocation ratio map 63d for motor assistance is the map which carried out the improvement in the maximum of the fuel consumption at the time of assistance with the driving force by the motor 5, and made the driving force allocation ratio of the engine drive of the maximum ****** case, and the motorised force power consumption correspond to whenever [car-body-speed], and an accelerator opening signal.

[0030] With reference to drawing 3 , the driving force allocation ratio map 63d [for motor assistance] creation approach is explained. In addition, drawing 3 is the explanatory view of the driving force allocation ratio map 63d [for motor assistance] creation approach. First, Maps 63a, 63b, and 63c are prepared.

[0031] Map 63a is a fuel consumption map when driving force with an engine 3 attains target driving force 100%. Specifically, map 63a is the map which set up the fuel consumption of the engine 3 in each lattice point with each target driving force at the time of **ing whenever [at the time of **ing whenever / car-body-speed / at spacing (for example, 1 km/h spacing) whenever / fixed car-body-speed / from 0 km/h to whenever / highest car-body-speed / each car-body-speed], and target driving force from 0N to the maximum target driving force at intervals of fixed target driving force (for example, 1-N spacing).

[0032] Moreover, map 63b is a fuel consumption map predicted when the driving force by the motor 5 is assisted, in order to attain target driving force. Furthermore, since the motorised force is made to act in the range of 100% or less 0% or more of target driving force when assisting by the motor 5, map 63b map-izes fuel consumption at the time of **ing the driving force allocation ratio (%) to a motor 5 at intervals of a fixed rate (for example, 1% spacing) in 100% or less of range 0% or more. Therefore, map 63b has two or more maps which receive each driving force allocation ratio (%) to a motor 5. Map 63b whenever [car-body-speed] whenever [fixed car-body-speed] from 0 km/h to whenever [highest car-body-speed] specifically Spacing Whenever [at the time of coming down (for example, at intervals of 1 km/h) / each car-body-speed], and target driving force from 0N to the maximum target driving force Fixed target driving force spacing It is the map which set up the fuel consumption which is predicted in the case of each driving force allocation ratio to the motor 5 in each lattice point with each target driving force at the time of coming down (for example, at intervals of 1N).

[0033] Moreover, map 63c is a power consumption map at the time of assisting the driving force by the motor 5, in order to attain target driving force. Furthermore, since the motorised force is made to act in the range of 100% or less 0% or more of target driving force when assisting by the motor 5, map 63c also map-izes power consumption at the time of **ing the driving force allocation ratio (%)

to a motor 5 at intervals of a fixed rate (for example, 1% spacing) in 100% or less of range 0% or more. Therefore, map 63c also has two or more maps which receive each driving force allocation ratio (%) to a motor 5. Map 63c whenever [car-body-speed] whenever [fixed car-body-speed] from 0 km/h to whenever [highest car-body-speed] specifically Spacing Whenever [at the time of coming down (for example, at intervals of 1 km/h) / each car-body-speed], and target driving force from 0N to the maximum target driving force Fixed target driving force spacing It is the map which set up the power consumption in the case of each driving force allocation ratio to the motor 5 in each lattice point with each target driving force at the time of coming down (for example, at intervals of 1N).
[0034] Next, it is based on (1) type described above using each value of Maps 63a, 63b, and 63c. Whenever [car-body-speed] whenever [fixed car-body-speed] from 0 km/h to whenever [highest car-body-speed] Spacing As opposed to each lattice point with each target driving force at the time of **ing whenever [at the time of coming down (for example, at intervals of 1 km/h) / each car-body-speed], and target driving force from 0N to the maximum target driving force at intervals of fixed target driving force (for example, 1-N spacing) The improvement contribution in a fuel at the time of **ing the driving force allocation ratio (%) to a motor 5 at intervals of a fixed rate (for example, 1% spacing) in 100% or less of range 0% or more is computed. Therefore, as an improvement contribution in a fuel, when fixed rate spacing of the driving force allocation ratio (%) to a motor 5 is made into spacing 1%, 101 pieces are computed, for example. And the maximum improvement contribution in a fuel is chosen out of this computed improvement contribution in a fuel, and the driving force allocation ratio (%) to the motor 5 in the selected improvement contribution in a fuel is chosen. That is, the driving force allocation ratio (%) to the motor 5 in case [the power consumption at the time of adding the driving force by the amount of fuel consumption reduction / motor 5 predicted when the driving force by the motor 5 is added] serves as max is chosen. Consequently, if an engine 3 and a motor 5 are controlled by the selected driving force allocation ratio, fuel consumption will carry out the maximum reduction, and the energy efficiency as a hybrid system by the maximum prevention, the engine 3, and the motor 5 will become the optimal [power consumption]. Incidentally, fuel consumption when driving force with an engine 3 attains target driving force 100% is more than fuel consumption predicted when the driving force of a motor 5 is always added. In addition, with the gestalt of this operation, EF of (1) type is the fuel consumption of the engine 3 in each lattice point of whenever [each car-body-speed / of map 63a], and each target driving force. AF is fuel consumption which is predicted in the case of each driving force allocation ratio to the motor 5 in each lattice point of whenever [each car-body-speed / of map 63b], and each target driving force. PU is the power consumption in the case of each driving force allocation ratio to the motor 5 in each lattice point of whenever [each car-body-speed / of map 63c], and each target driving force.
[0035] Finally, based on each driving force allocation ratio to the motor 5 chosen to each lattice point of whenever [each car-body-speed], and each target driving force, driving force allocation ratio map 63d for motor assistance is created. Consequently, in driving force allocation ratio map 63d for motor assistance, the driving force allocation ratio MD for motor assistance from which the energy efficiency at the time of the assistance by the motor 5 becomes the optimal can be chosen to the target driving force TD of BS and arbitration whenever [car-body-speed / of arbitration]. In addition, since Maps 63a, 63b, and 63c are maps respectively set up based on the property of the engine 3 carried in a car 1, the property of a motor 5, etc., they turn into a map reflecting the property of the engine 3 carried in a car 1, the property of a motor 5, etc. driving force allocation ratio map 63d for motor assistance set up based on these maps 63a, 63b, and 63c.
[0036] Next, the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit is explained. The target driving force TD from BS and the target driving force setting section 62 is inputted [whenever / car-body-speed] whenever [from the presumed section 60 / car-body-speed], and the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit outputs the driving force allocation ratio GD for generation-of-electrical-energy transit to the map change section 67. The driving force allocation ratio setting section 64 for generation-of-electrical-energy transit was equipped with storage means, such as ROM, and has memorized driving force allocation ratio map 64d for generation-of-electrical-energy transit to which BS, and the target

driving force TD and the driving force allocation ratio GD for generation-of-electrical-energy transit correspond whenever [car-body-speed / which was beforehand set up based on the experimental value or the design value] (refer to drawing 4). And the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit reads the driving force allocation ratio GD for generation-of-electrical-energy transit which corresponds considering BS and the target driving force TD as the address whenever [car-body-speed]. In addition, driving force allocation ratio map 64d for generation-of-electrical-energy transit is the map which made the driving force allocation ratio for generation-of-electrical-energy transit at the time of carrying out the maximum reservation of the maximum prevention and the charge for aggravation of fuel consumption correspond to whenever [car-body-speed], and an accelerator opening signal, when charging a dc-battery 9 by the generation of electrical energy by the motor 5.

[0037] With reference to drawing 4 , the driving force allocation ratio map 64d [for generation-of-electrical-energy transit] creation approach is explained. In addition, drawing 4 is the explanatory view of the driving force allocation ratio map 64d [for generation-of-electrical-energy transit] creation approach. First, Maps 64a, 64b, and 64c are prepared. In addition, since map 64a is the same map as the above mentioned map 63a, it omits explanation.

[0038] Map 64b is a fuel consumption map predicted when the generation-of-electrical-energy force by the motor 5 is added. Furthermore, since the transit energy of the car 1 consumed by the generation of electrical energy by the motor 5 is generated with driving force with an engine 3, with an engine 3, it carries out to generating the driving force consumed by the motor 5 in 100% or less of range 0% or more to target driving force. Then, map 64b map-izes fuel consumption at the time of **ing an allocation ratio (%) at intervals of a fixed rate (for example, 1% spacing) in 0% or less of range -100% or more at the time of the charge to a motor 5. Therefore, map 64b has two or more maps which receive an allocation ratio (%) at the time of each charge to a motor 5. In addition, since driving force was further added to target driving force when the generation-of-electrical-energy force by the motor 5 was added, the allocation ratio (%) was made into the negative value at the time of the charge to a motor 5. Map 64b whenever [car-body-speed] whenever [fixed car-body-speed] from 0 km/h to whenever [highest car-body-speed] specifically Spacing Whenever [at the time of coming down (for example, at intervals of 1 km/h) / each car-body-speed], and target driving force from 0N to the maximum target driving force Fixed target driving force spacing It is the map which set up the fuel consumption which is predicted at the time of each charge to the motor 5 in each lattice point with each target driving force at the time of coming down (for example, at intervals of 1N) in the case of an allocation ratio.

[0039] Moreover, map 64c is a power charge map at the time of adding the generation-of-electrical-energy force by the motor 5. Furthermore, since it generates electricity by the motor 5 in the range of 0% or less -100% or more of target driving force in adding the generation-of-electrical-energy force by the motor 5, map 64c also map-izes the power charge at the time of **ing an allocation ratio (%) at intervals of a fixed rate (for example, 1% spacing) in 0% or less of range -100% or more at the time of the charge to a motor 5. Therefore, map 64c also has two or more maps which receive an allocation ratio (%) at the time of each charge to a motor 5. Map 64c whenever [car-body-speed] whenever [fixed car-body-speed] from 0 km/h to whenever [highest car-body-speed] specifically Spacing Whenever [at the time of coming down (for example, at intervals of 1 km/h) / each car-body-speed], and target driving force from 0N to the maximum target driving force Fixed target driving force spacing It is the map which set up the power charge in the case of an allocation ratio at the time of each charge to the motor 5 in each lattice point with each target driving force at the time of coming down (for example, at intervals of 1N).

[0040] Next, it is based on (2) types described above using each value of Maps 64a, 64b, and 64c. Whenever [car-body-speed] whenever [fixed car-body-speed] from 0 km/h to whenever [highest car-body-speed] Spacing As opposed to each lattice point with each target driving force at the time of **ing whenever [at the time of coming down (for example, at intervals of 1 km/h) / each car-body-speed], and target driving force from 0N to the maximum target driving force at intervals of fixed target driving force (for example, 1-N spacing) The improvement contribution in a fuel is computed at the time of the charge at the time of **ing an allocation ratio (%) at intervals of a fixed rate (for example, 1% spacing) in 0% or less of range -100% or more at the time of the charge to a

motor 5. Therefore, at the time of charge, as an improvement contribution in a fuel, when fixed rate spacing of an allocation ratio (%) is made into spacing 1% at the time of the charge to a motor 5, 101 pieces are computed, for example. And an allocation ratio (%) is chosen out of the improvement contribution in a fuel at the time of the charge to the motor 5 in the improvement contribution in a fuel at the time of the charge which chose the improvement contribution in a fuel and chose at the time of the minimum charge at the time of this computed charge. That is, an allocation ratio (%) is chosen at the time of the charge to the motor 5 in case [the power charge at the time of adding the generation-of-electrical-energy force by the fuel consumption augend / motor 5 predicted when the generation-of-electrical-energy force by the motor 5 is added] serves as min. consequently, the fuel consumption which will increase if an engine 3 and a motor 5 are controlled by the allocation ratio at the time of the selected charge -- the maximum prevention and a power charge -- the maximum -- it becomes [many] and the energy efficiency as a hybrid system by the engine 3 and the motor 5 becomes the optimal. Incidentally, fuel consumption when driving force with an engine 3 attains target driving force 100% is below fuel consumption predicted when the generation-of-electrical-energy force by the motor 5 is always added. In addition, with the gestalt of this operation, EF of (2) types is the fuel consumption of the engine 3 in each lattice point of whenever [each car-body-speed / of map 64a], and each target driving force. GF is fuel consumption which is predicted at the time of each charge to the motor 5 in each lattice point of whenever [each car-body-speed / of map 64b], and each target driving force in the case of an allocation ratio. PC is a power charge in the case of an allocation ratio at the time of each charge to the motor 5 in each lattice point of whenever [each car-body-speed / of map 64c], and each target driving force.

[0041] Finally, based on an allocation ratio, driving force allocation ratio map 64d for generation-of-electrical-energy transit is created at the time of each charge to the motor 5 chosen to each lattice point of whenever [each car-body-speed], and each target driving force. Consequently, in driving force allocation ratio map 64d for a generation of electrical energy, the driving force allocation ratio GD for generation-of-electrical-energy transit from which the energy efficiency at the time of the generation of electrical energy by the motor 5 becomes the optimal can be chosen to the target driving force TD of BS and arbitration whenever [car-body-speed / of arbitration]. In addition, since Maps 64a, 64b, and 64c are maps respectively set up based on the property of the engine 3 carried in a car 1, the property of a motor 5, etc., they turn into a map reflecting the property of the engine 3 carried in a car 1, the property of a motor 5, etc. driving force allocation ratio map 64d for generation-of-electrical-energy transit set up based on these maps 64a, 64b, and 64c.

[0042] Next, the driving force allocation ratio setting section 65 for a slip is explained. The target driving force TD from BS and the target driving force setting section 62 is inputted [whenever / car-body-speed] whenever [from the presumed section 60 / car-body-speed], and the driving force allocation ratio setting section 65 for a slip outputs the driving force allocation ratio SD for a slip to the map change section 67. The driving force allocation ratio setting section 65 for a slip was equipped with storage means, such as ROM, and has memorized the driving force allocation ratio map for a slip (not shown) on which BS and the target driving force TD, and the driving force allocation ratio SD for a slip correspond whenever [road surface mu estimate / which was beforehand set up based on the experimental value or the design value /, and car-body-speed]. In addition, road surface mu estimate is computed using the slip ratio computed by the slip detecting element 61. And the driving force allocation ratio setting section 65 for a slip reads the driving force allocation ratio SD for a slip which corresponds considering BS and the target driving force TD as the address whenever [road surface mu estimate and car-body-speed].

[0043] Next, the map change judging section 66 is explained. The target driving force TD from the slip detecting signal SS from BS and the slip detecting element 61 and the target driving force setting section 62 is inputted [whenever / dc-battery current signal / from a current sensor 12 / BC, battery voltage signal / from a voltage sensor 13 / BV, and car-body-speed] whenever [from the presumed section 60 / car-body-speed], and the map change judging section 66 outputs the map judging signal MS to the map change section 67. Therefore, the map change judging section 66 has memorized assistance/generation-of-electrical-energy change map 66a for judging the use field of a driving force allocation ratio map with BS and the target driving force TD whenever [car-body-speed / which was beforehand set up based on the experimental value or the design value] (refer to drawing 5). First,

the map change judging section 66 computes the dc-battery power residue SOC based on the dc-battery current signal BC and the battery voltage signal BV. And when the slip judging signal SS is 1, the map change judging section 66 sets up [a slip] as a map judging signal MS. On the other hand, when the slip judging signal SS is 0, the map change judging section 66 judges whether based on assistance/generation-of-electrical-energy change map 66a, driving force allocation ratio map 63d for motor assistance is used, or driving force allocation ratio map 64d for generation-of-electrical-energy transit is used based on BS whenever [target driving force TD and car-body-speed]. And the map change judging section 66 sets up [motor assistance] as a map judging signal MS, when using driving force allocation ratio map 63d for motor assistance, and when using driving force allocation ratio map 64d for generation-of-electrical-energy transit, it sets up [generation-of-electrical-energy transit] as a map judging signal MS.

[0044] Here, with reference to drawing 5 , assistance/generation-of-electrical-energy change map 66a is explained. In addition, (a) is the explanatory view of assistance/generation-of-electrical-energy change map, drawing 5 is assistance/generation-of-electrical-energy change map 66a, and (d) is [(b) is a case with many dc-battery power residues, and / (c) is the case where a dc-battery power residue is whenever / middle /, and] a case with few dc-battery power residues. Assistance/generation-of-electrical-energy change map 66a is a map for judging whether driving force allocation ratio map 63d for motor assistance is used as a driving force allocation ratio map, or driving force allocation ratio map 64d for generation-of-electrical-energy transit is used from the relation of whenever [target driving force and car-body-speed] (refer to drawing 3 and drawing 4). Therefore, assistance/generation-of-electrical-energy change map 66a has driving force allocation ratio map use field (it is hereafter indicated as field for motor assistance) 66b for motor assistance, and driving force allocation ratio map use field (it is hereafter indicated as field for generation-of-electrical-energy transit) 66c for generation-of-electrical-energy transit bordering on 66d of change threshold lines. Furthermore, with a dc-battery power residue, assistance/generation-of-electrical-energy change map 66a changes the location of 66d of change threshold lines, and changes field 66b for motor assistance, and field 66c for generation-of-electrical-energy transit. Therefore, assistance/generation-of-electrical-energy change map 66a is equipped with two or more maps according to a dc-battery power residue.

[0045] As shown in the (a) Fig. of drawing 5 , whenever [car-body-speed] is set up as an axis of abscissa, and, as for assistance/generation-of-electrical-energy change map 66a, target driving force is set up as an axis of ordinate. Moreover, as for assistance/generation-of-electrical-energy change map 66a, 66d of change threshold lines is set as the field more than the target driving force of rolling resistance line 66e of parallel and 0% inclination to rolling resistance line 66e of 0% inclination. And field 66b for motor assistance is a field where target driving force is larger than 66d of change threshold lines to whenever [car-body-speed], and field 66c for generation-of-electrical-energy transit is a field between rolling resistance line 66e of 0% inclination, and 66d of change threshold lines. Furthermore, 66d of change threshold lines approaches rolling resistance line 66e of 0% inclination, it is set up, so that assistance/generation-of-electrical-energy change map 66a has many dc-battery power residues, and motor assistant field 66b becomes large. On the other hand, 66d of change threshold lines estranges from rolling resistance line 66e of 0% inclination, assistance/generation-of-electrical-energy change map 66a is set up, so that there are few dc-battery power residues, and field 66c for generation-of-electrical-energy transit becomes large. Thus, by enlarging field 66c for generation-of-electrical-energy transit, if a dc-battery power residue begins to decrease, a car will charge by the time of the fixed vehicle speed, or the motor, if a dc-battery power residue still decreases, a car will charge by the time of weak acceleration, or the motor, and if a dc-battery power residue decreases further, a car will come to charge by the motor also in the time of strong acceleration, so that a dc-battery power residue decreases. In addition, rolling resistance line 66e of 0% inclination is the line which showed the rolling resistance in a flat way with the relation between whenever [car-body-speed], and target driving force. If the driving force of a car incidentally becomes smaller than this rolling resistance in the condition of having got into the accelerator pedal, a car will be slowed down without the present rate being unmaintainable.

[0046] A dc-battery power residue is enough for the (b) Fig. of drawing 5 , and assistance/generation-of-electrical-energy change map 66a1 when 1 is set up 66d of change threshold

lines in accordance with rolling resistance line 66e of 0% inclination is shown in it. In this case, since there are many dc-battery power residues, it is not necessary to charge a dc-battery 9. So, on assistance/generation-of-electrical-energy change map 66a1, only the field 66b1 for motor assistance (slash field by the continuous line) is set up. In this case, charge by the motor 5 is performed only at the time of moderation of a car 1.

[0047] A dc-battery power residue decreases in the (c) Fig. of drawing 5 , and assistance/generation-of-electrical-energy change map 66a2 when 2 estranges and is set up from rolling resistance line 66e of 0% inclination 66d of change threshold lines is shown in it. In this case, since the dc-battery power residue has decreased, the frequency where a dc-battery 9 is charged is made to increase. So, on assistance/generation-of-electrical-energy change map 66a2, the field 66c2 for generation-of-electrical-energy transit (slash field by the broken line) is increased, and the field 66b2 for motor assistance (slash field by the continuous line) is reduced and set up. In this case, charge by the motor 5 is performed also in the time of the fixed vehicle speed of a car 1, and weak acceleration.

[0048] A dc-battery power residue decreases in the (d) Fig. of drawing 5 remarkably, and assistance/generation-of-electrical-energy change map 66a3 when 3 estranges most and is set up from rolling resistance line 66e of 0% inclination 66d of change threshold lines is shown in it. In this case, since there are very few dc-battery power residues, the frequency where a dc-battery 9 is charged is made into max. So, on assistance/generation-of-electrical-energy change map 66a3, the field 66c3 for generation-of-electrical-energy transit (slash field by the broken line) is increased by max, and the field 66b3 for motor assistance (slash field by the continuous line) is reduced and set as min. In this case, charge by the motor 5 is performed also in the time of strong acceleration of a car 1.

[0049] Next, the map change section 67 is explained. The map change section 67 The map judging signal MS from the map change judging section 66 The driving force allocation ratio MD for motor assistance from the driving force allocation ratio setting section 63 for motor assistance The driving force allocation ratio SD for a slip from the driving force allocation ratio GD for generation-of-electrical-energy transit from the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit and the driving force allocation ratio setting section 65 for a slip is inputted. The driving force allocation ratio MD for motor assistance, and the driving force allocation ratio GD for generation-of-electrical-energy transit and one driving force allocation ratio of the driving force allocation ratios SD for a slip are outputted to the engine drive setting section 68 and the motorised force setting section 69. The map change section 67 outputs the driving force allocation ratio MD for motor assistance, when the map judging signal MS is [motor assistance], when the map judging signal MS is [generation-of-electrical-energy transit], it outputs the driving force allocation ratio GD for generation-of-electrical-energy transit, and when the map judging signal MS is [a slip], it outputs the driving force allocation ratio SD for a slip.

[0050] Next, the engine drive setting section 68 is explained. The driving force allocation ratio MD for motor assistance, and the driving force allocation ratio GD for generation-of-electrical-energy transit and one driving force allocation ratio of the driving force allocation ratios SD for a slip are inputted from the target driving force TD and the map change section 67 from the target driving force setting section 62, and the engine drive setting section 68 outputs engine drive TED to the engine drive signal setting section 70. The engine drive setting section 68 computes engine drive TED based on the driving force allocation ratio and the target driving force TD which were inputted. In addition, in the case of the driving force allocation ratio GD for generation-of-electrical-energy transit, engine drive TED turns into more than driving force when an engine 3 attains the target driving force TD 100%.

[0051] Next, the motorised force setting section 69 is explained. The driving force allocation ratio MD for motor assistance, and the driving force allocation ratio GD for generation-of-electrical-energy transit and one driving force allocation ratio of the driving force allocation ratios SD for a slip are inputted from the target driving force TD and the map change section 67 from the target driving force setting section 62, and the motorised force setting section 69 outputs the motorised force TMD to the motor demand torque signal setting section 71. The motorised force setting section 69 computes the motorised force TMD based on the driving force allocation ratio and the target driving force TD which were inputted. In addition, in the case of the driving force allocation ratio

GD for generation-of-electrical-energy transit, the motorised force TMD serves as a negative value, and turns into motor generation-of-electrical-energy force.
[0052] Next, the engine drive signal setting section 70 is explained. The engine drive TED from the engine drive setting section 68 is inputted, and the engine drive signal setting section 70 outputs the engine drive signal ED to the DBW driver 25. The engine drive signal setting section 70 computes the opening of a throttle valve 26 based on engine drive TED. Furthermore, based on this computed opening, the engine drive signal setting section 70 sets up the engine speed and hand of cut of a motor of the DBW driver 25, and is taken as the engine drive signal ED.
[0053] Next, the motor demand torque signal setting section 71 is explained. The motorised force TMD from the motorised force setting section 69 is inputted, and the motor demand torque signal setting section 71 outputs the motor demand torque signal MT to Motor Driver 15. The motor demand torque signal setting section 71 sets up the rotational frequency and hand of cut of a motor 5 based on the motorised force TMD. Furthermore, the motor demand torque signal setting section 71 sets up the motor demand torque signal MT which controls Motor Driver 15 based on the engine speed and hand of cut of this motor 5.
[0054] Actuation by the control unit 6 is explained to the last along with the control flow chart of drawing 6 . In addition, according to explanation, drawing 1 thru/or drawing 5 are referred to at any time.
[0055] A control unit 6 incorporates as a signal the various sensors 12, 13, 16, 17, and 18 arranged by the car 1 and the value detected from 23 grades. And the presumed section 60 computes [whenever / car-body-speed] BS whenever [car-body-speed] based on the wheel rotational frequency signal WS, the acceleration signal WA, etc. (S1).
[0056] Next, the slip detecting element 61 computes slip ratio based on BS whenever [wheel speed / which computed the wheel vehicle speed of each rings 2, 2, 4, and 4 based on the wheel rotational frequency signal WS etc., and was computed further], and, whenever [car-body-speed] (S2). Furthermore, the slip detecting element 61 judges whether the car 1 has slipped based on the computed slip ratio, and sets up the slip detecting signal SS (S3).
[0057] As for the target driving force setting section 62, in the case of 1 (it has slipped), the slip detecting signal SS computes road surface mu estimate based on the slip ratio of each rings 2, 2, 4, and 4 (S4). Furthermore, based on the AUW and road surface mu estimate of a car 1, the target driving force setting section 62 computes the transfer driving force at the time of a slip (S5), and makes this transfer driving force the target driving force TD (S6).
[0058] On the other hand, the target driving force which corresponds considering the table empty vehicle object rate BS and the accelerator opening signal AO with which the slip detecting signal SS has memorized the target driving force setting section 62 in the case of 0 (it has not slipped) as the address is read, and it considers as the target driving force TD (S7).
[0059] Furthermore, the driving force allocation ratio setting section 63 for motor assistance sets up the driving force allocation ratio MD for motor assistance based on BS and the target driving force TD from driving force allocation ratio map 63d for motor assistance whenever [car-body-speed] (S8). Moreover, the driving force allocation ratio setting section 64 for generation-of-electrical-energy transit sets up the driving force allocation ratio GD for generation-of-electrical-energy transit based on BS and the target driving force TD from driving force allocation ratio map 64d for generation-of-electrical-energy transit whenever [car-body-speed] (S8). Moreover, the driving force allocation ratio setting section 65 for a slip sets up the driving force allocation ratio SD for a slip from the driving force allocation ratio map for a slip based on BS and the target driving force TD whenever [road surface mu estimate and car-body-speed] (S8).
[0060] Then, when the slip detecting signal SS is 1, the map change judging section 66 sets up [a slip] as a map judging signal MS (S9). On the other hand, when the slip detecting signal SS is 0, the map change judging section 66 computes the dc-battery power residue SOC first based on the dc-battery current signal BC and the battery voltage signal BV. And the map change judging section 66 chooses assistance/generation-of-electrical-energy change map 66a based on the dc-battery power residue SOC. Furthermore, based on assistance/generation-of-electrical-energy change map 66a which the map change judging section 66 chose, the relation between BS and the target driving force TD judges the inside of field 66b for motor assistance, and field 66c for generation-of-electrical-

energy transit whenever [car-body-speed]. And in in field 66b for motor assistance, the map change judging section 66 sets up [motor assistance] as a map judging signal MS, and, in in field 66c for generation-of-electrical-energy transit, sets up [generation-of-electrical-energy transit] as a map judging signal MS (S9).
[0061] And the map change section 67 is changed to the driving force allocation ratio MD for motor assistance, when the map judging signal MS is [motor assistance]. When the map judging signal MS is [generation-of-electrical-energy transit], it changes to the driving force allocation ratio GD for generation-of-electrical-energy transit. When the map judging signal MS is [a slip], it changes to the driving force allocation ratio SD for a slip, and the changed driving force allocation ratio is outputted to the engine drive setting section 68 and the motorised force setting section 69 (S10).
[0062] Then, the engine drive setting section 68 computes engine drive TED based on the driving force allocation ratios MD, GD, and SD and the target driving force TD which were inputted (S11). Moreover, the motorised force setting section 69 computes the motorised force TMD based on the driving force allocation ratios MD, GD, and SD and the target driving force TD which were inputted (S12).
[0063] Finally, the engine drive signal setting section 70 sets up the engine drive signal ED based on engine drive TED, and outputs this engine drive signal ED to the DBW driver 25. On the other hand, the motor demand torque signal setting section 71 sets up the motor demand torque signal MT based on the motorised force TMD, and outputs this motor demand torque signal MT to Motor Driver 15.
[0064] Then, the opening of a throttle valve 26 is adjusted by the DBW driver 25 based on the engine drive signal ED, and the driving force of an engine 3 is controlled by it. On the other hand, based on the motor demand torque signal MT, the rotational frequency and hand of cut of a motor 5 are adjusted by Motor Driver 15, and the driving force of a motor 5 is controlled by it. Moreover, based on the motor demand torque signal MT, a motor 5 is controlled by Motor Driver 15, and charge by the motor 5 is controlled.
[0065] According to this control unit 6, the driving force allocation ratio MD for motor assistance which is most excellent in the relation between fuel consumption and power consumption with driving force allocation ratio map 63d for motor assistance set up using (1) type at energy efficiency to the target driving force of whenever [car-body-speed / of the arbitration at the time of the assistance by the motor 5], and arbitration can be chosen. Moreover, according to the control unit 6, the driving force allocation ratio GD for generation-of-electrical-energy transit which is most excellent in the relation between fuel consumption and a power charge with driving force allocation ratio map 64d for generation-of-electrical-energy transit set up using (2) types at energy efficiency to the target driving force of whenever [car-body-speed / of the arbitration at the time of the generation of electrical energy by the motor 5], and arbitration can be chosen. Furthermore, since choosing cuts whether driving force allocation ratio map 63d for motor assistance is used according to the dc-battery power residue SOC by assistance/generation-of-electrical-energy change map 66a, or driving force allocation ratio map 64d for generation-of-electrical-energy transit is used, this control device 6 can secure the dc-battery power residue SOC, considering energy efficiency. Furthermore, in this control device 6, since the maximum control of the power consumption is carried out, the dc-battery 9 with a small charge capacity can be used.
[0066] As mentioned above, this invention is carried out with various gestalten, without being limited to the gestalt of the aforementioned operation. For example, although the driving force allocation ratio map for generation-of-electrical-energy transit was beforehand set up using the driving force allocation ratio map for motor assistance, and (2) types using (1) type, you may constitute so that each driving force allocation ratio may be computed by count in a control unit using (1) type and (2) types. Moreover, although each map was set up by making whenever [car-body-speed], and target driving force into a parameter, each map may be set up with other parameters which show the operational status of a car. Moreover, although it constituted so that the driving force allocation ratio on three maps might be automatically changed with a control device, you may make it a driver change by the manual. Moreover, although the driving force allocation ratio SD for a slip was set up on the driving force allocation ratio map for a slip at the time of a slip and engine drive and the motorised force were computed based on this driving force allocation ratio SD for a slip, you may compute as follows. First, whenever [car-body-speed / at the time of a slip],

and target driving force are set up based on the driving force (driving force which can be transmitted between a road surface and a wheel) which was computed from the AUW and road surface mu estimate of a car and which can be transmitted. Furthermore, the driving force allocation ratio which is most excellent in energy efficiency with the relation between fuel consumption and power consumption is set up from whenever [car-body-speed / at the time of the set-up slip], and, target driving force. And engine drive and the motorised force may be computed based on this set-up target driving force and a driving force allocation ratio.

[0067]

[Effect of the Invention] In case a drive car [control unit] before and after starting claim 1 of this invention is assisted with the driving force of a motor, the power consumption of a motor can carry out the maximum reduction of the fuel consumption of the maximum prevention **** engine by choosing a driving force allocation ratio so that [power consumption of the amount of fuel consumption reduction / motor by motor assistance] may serve as max with an allocation ratio setting means. Consequently, in this control device, the energy efficiency as a hybrid system by the engine and the motor improves.

[0068] In case the control unit of a drive car before and after starting claim 2 of this invention is generated by the motor, it can carry out the maximum increment of the power charge according the increment in engine fuel consumption to the maximum prevention **** motor by choosing an allocation ratio at the time of charge so that [the power charge to the accumulation-of-electricity means by the fuel consumption augend / motor generation-of-electrical-energy force by the motor generation-of-electrical-energy force] may serve as min with an allocation ratio setting means at the time of charge. Consequently, in this control device, the energy efficiency as a hybrid system by the engine and the motor improves.

[Translation done.]

DESCRIPTION OF DRAWINGS

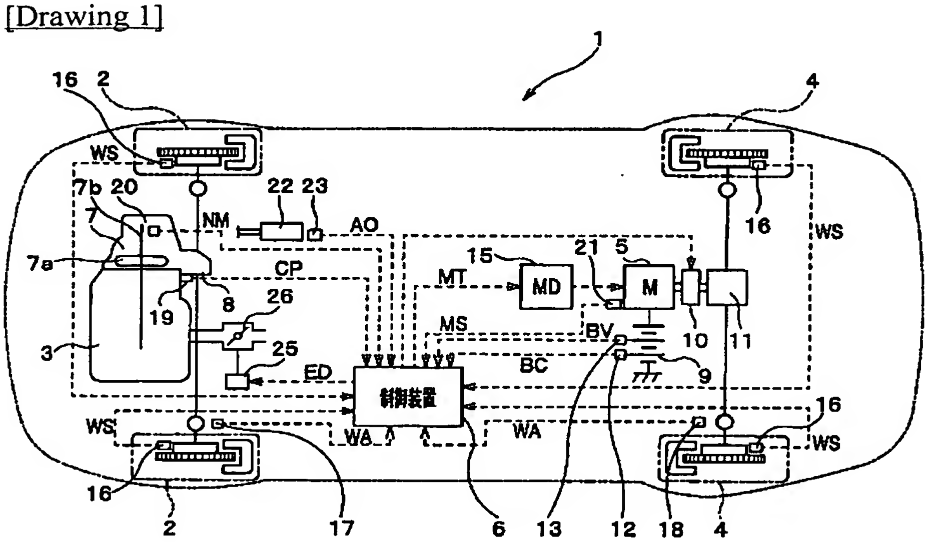
[Brief Description of the Drawings]
[Drawing 1] It is the whole ring drive car block diagram before and after starting the gestalt of this operation.
[Drawing 2] It is the block diagram of the control unit of a ring drive car before and after starting the gestalt of this operation.
[Drawing 3] It is the explanatory view of the creation approach of the driving force allocation ratio map for motor assistance with which the driving force allocation ratio setting section for motor assistance of drawing 2 is equipped.
[Drawing 4] It is the explanatory view of the creation approach of the driving force allocation ratio map for generation-of-electrical-energy transit with which the driving force allocation ratio setting section for generation-of-electrical-energy transit of drawing 2 is equipped.
[Drawing 5] In (a), it is assistance/generation-of-electrical-energy change map when there are many dc-battery power residues, and it is assistance/generation-of-electrical-energy change map of the map change judging section of drawing 2 , and (d) is [it is the explanatory view of assistance/generation-of-electrical-energy change map, and / (b) / (c) / it is assistance/generation-of-electrical-energy change map in case a dc-battery power residue is whenever / middle /, and] assistance/generation-of-electrical-energy change map when there are few dc-battery power residues.
[Drawing 6] It is the control flow chart of the control device of drawing 2 .
[Description of Notations]
1 ... Order ring drive car
2 ... Front wheel
3 ... Engine
4 ... Rear wheel
5 ... Motor
6 ... Control unit
9 ... Dc-battery (accumulation-of-electricity means)
62 ... Target driving force setting section (target driving force setting means)
63 ... The driving force allocation ratio setting section for motor assistance (allocation ratio setting means)
64 ... The driving force allocation ratio setting section for generation-of-electrical-energy transit (at the time of charge allocation ratio setting means)

[Translation done.]

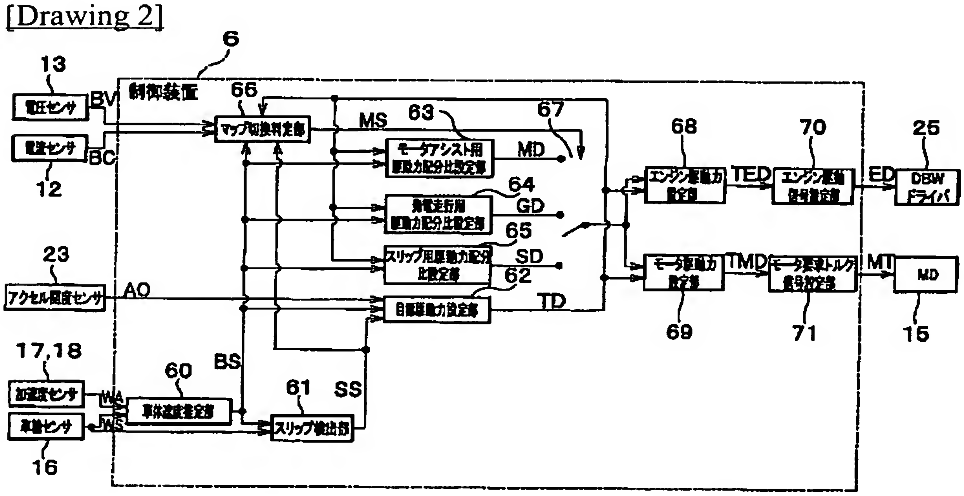
* NOTICES *

DRAWINGS

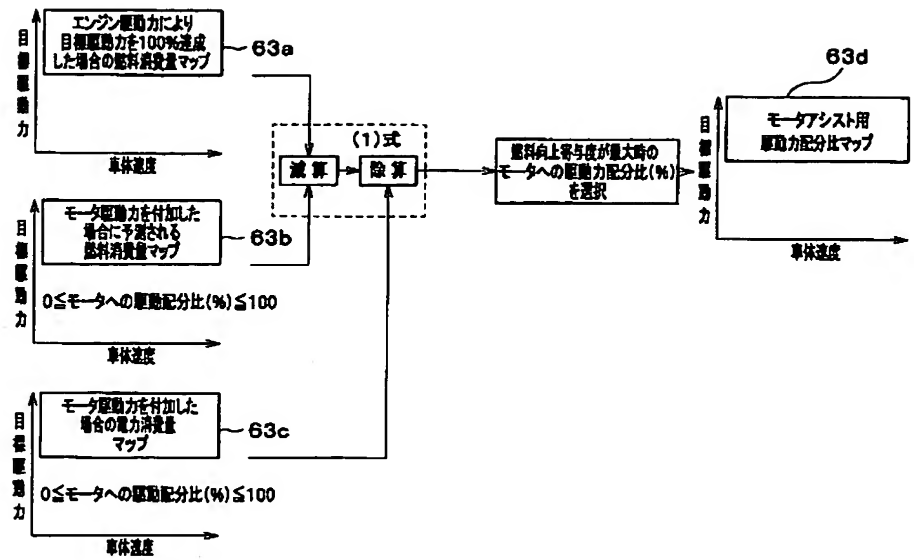
[Drawing 1]



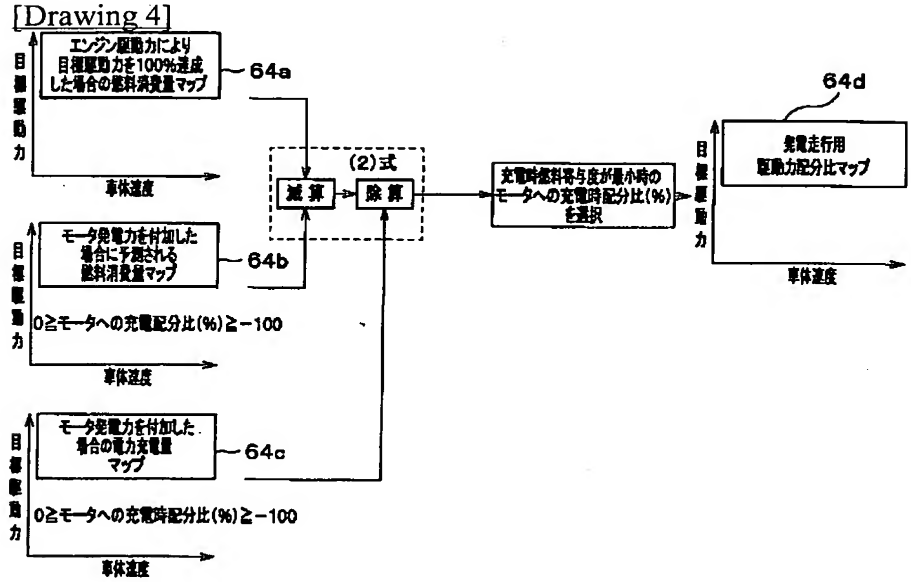
[Drawing 2]



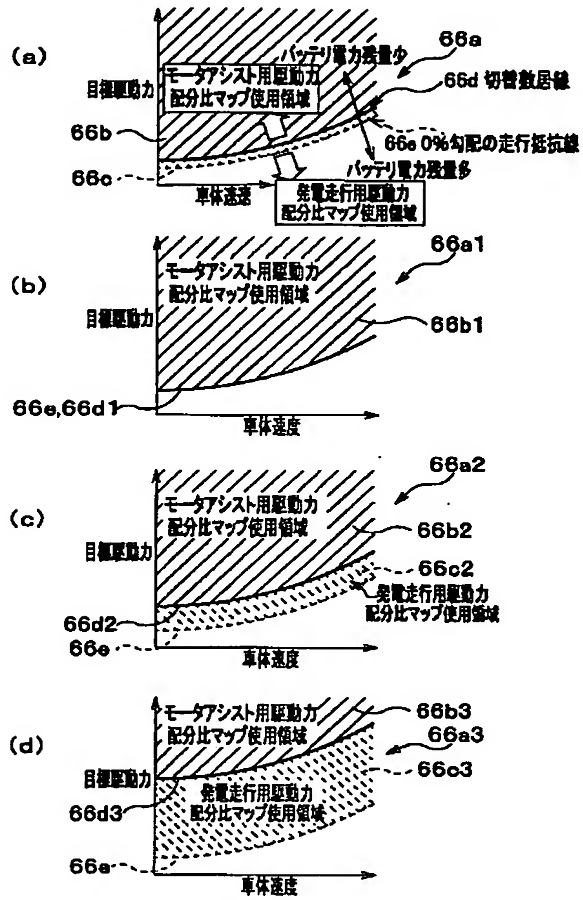
[Drawing 3]



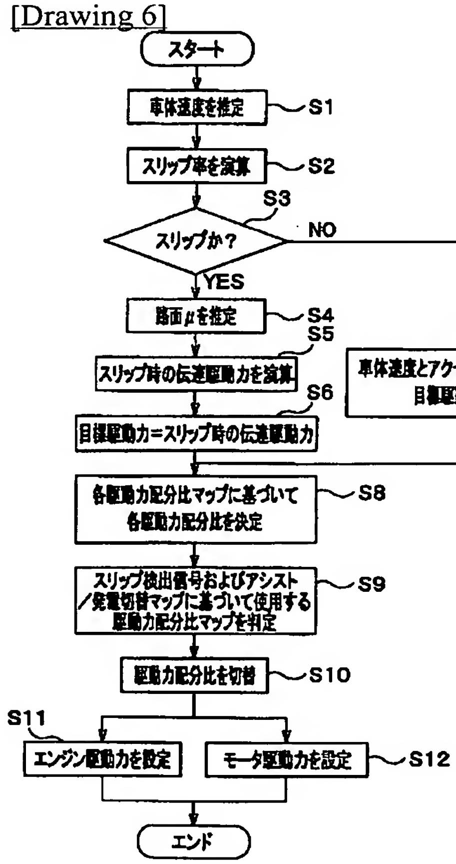
[Drawing 4]



[Drawing 5]


(a)
目標駆動力
モータアシスト用駆動力配分比マップ使用領域
バッテリ電力残量少
66a
66d 切替敷居線
66b
66e 0%勾配の走行抵抗線
バッテリ電力残量多
66c
車体速度
発電走行用駆動力配分比マップ使用領域
(b)
66a1
モータアシスト用駆動力配分比マップ使用領域
目標駆動力
66b1
66e,66d1
車体速度
(c)
66a2
モータアシスト用駆動力配分比マップ使用領域
66b2
目標駆動力
66c2
発電走行用駆動力配分比マップ使用領域
66d2
66e
車体速度
(d)
モータアシスト用駆動力配分比マップ使用領域
66b3
66a3
66c3
目標駆動力
発電走行用駆動力配分比マップ使用領域
66d3
66e
車体速度

[Drawing 6]


スタート
車体速度を推定
S1
スリップ率を演算
S2
S3
スリップか？
NO
YES
路面μを推定
S4
S5
スリップ時の伝達駆動力を演算
S7
車体速度とアクセル開度に基づいて目標駆動力を設定
S6
目標駆動力＝スリップ時の伝達駆動力
各駆動力配分比マップに基づいて各駆動力配分比を決定
S8
スリップ検出信号およびアシスト/発電切替マップに基づいて使用する駆動力配分比マップを判定
S9
駆動力配分比を切替
S10
S11
エンジン駆動力を設定
モータ駆動力を設定
S12
エンド

[Translation done.]